

TREATMENT OF FRACTURES.¹

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SURGERY of recent years has advanced in almost all lines, but perhaps most markedly in the direction of the various internal organs. At present, surgical literature is almost monopolized by articles on operations affecting the liver, kidneys, stomach, intestines, and the abdominal viscera generally.

Operative surgery is *the* surgery of the day, and non-operative work has become somewhat ignored. Many of us will recall the days when the subjects of fractures, dislocations, etc., formed a far more important part of one's stock of surgical knowledge than they appear to do to-day. To those of us, however, who have large surgical wards under our care, the importance of fractures should especially appeal. They are as frequent now as they were formerly, and demand the same careful skill and attention if good results are to be achieved. Let us guard against the temptation to devote our attention to the operative cases and leave the fractures too much to the care of our assistants.

The extremely rapid progress of modern surgery has been largely due to our ability to maintain wounds aseptic since the introduction of Lister's method. The treatment of fractures has been influenced by this method as well as other departments of surgery; hence we find operative measures resorted to more frequently than was previously the case. The other discovery which has been of great importance in fractures is that of the Röntgen or X-rays. It has perhaps hardly met the sanguine expectations first raised, but it has proved of very decided utility.

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In addition to the introduction of the antiseptic system and the X-rays, I find but comparatively few advances, and those mainly in the treatment of the individual fractures. Hamilton and Stimson, our old standard treatises, have not been surpassed nor displaced by any more recent publications.

The old battle between the use of plaster-of-Paris and splints is still being waged as industriously as ever. Perhaps a fair comment of present methods would be to say that the profession is hardly as conversant with the dressings at its disposal as it should be.

Bandaging used to be a fine art, but since the introduction of the gauze bandage it seems to have degenerated, and is but little studied. The gauze bandage so readily adapts itself to a part as to conduce to slovenliness in its application. Nevertheless, there is a right way and a wrong way of bandaging, and the right way is still the best.

As regards the use of immovable dressings, such as plaster-of-Paris, I have never been able to content myself to place recent fractures up in plaster and allow them to remain until union is firm. I desire to assure myself by direct inspection, once or twice a week, that the fragments are in proper apposition, and any dressing not allowing this is deemed unsuitable. For this reason, for the first ten days some form of splints is always used. In some cases the tendency to deformity is lacking, and in such fixed dressings can be used as soon as the acute symptoms have subsided. If there is any tendency to deformity, the case is treated with splints until the deformity is overcome, and then the limb can be put in plaster.

It is the custom of some surgeons to correct the deformity and then immediately apply plaster, with the idea that the plaster will hold the limb in its corrected position. This is not my practice.

Should the displacement show a tendency to recur, the plaster dressing is often insufficient to overcome it. The swelling subsides and the limb shrinks, and the plaster is no longer closely applied to it. If a plaster dressing is used, it should be in conjunction with examinations by the X-rays. By them one

is able to see the relative position of the fractured bones and be assured that they are properly placed.

The use of silicate of soda or soluble glass is hardly as common as it deserves to be. It makes a light, firm bandage, and is cleaner and more available than plaster. A physician in private practice can keep a pint bottle of it on hand, which is always ready for use; it does not deteriorate. In using it, it is only necessary to see that it really impregnates the bandage and is not simply smeared on its surface. In preparing a bandage for application, a quantity of the silicate may be placed in a basin and a gauze bandage passed through it and rolled with the hands; the surplus silicate is squeezed out and the bandage is ready for use.

Three or four bandages so prepared suffice for a broken leg. After its application, the hand is dipped in warm water, the bandage smoothed down, and the patient kept abed twenty-four hours, by which time the silicate will be quite hard. It can later be cut open with a stout knife and laced. If it is desired to lace it, it is my custom to have large hooks sewn to two strips of bandage. These are wet with the silicate and placed on each side of the cut. They are retained by a few turns of an ordinary bandage and will be hardened in place by the following day. These bandages can be prepared and kept ready for use covered with silicate in a wide-mouthed jar.

A strip of tin should be laid on each side of the leg and included in the bandage, and tends to prevent it wrinkling while being applied and drying. It is better to smooth the outside of the dressing with water rather than silicate, as the bandage dries quicker and harder. The use of starch is also worth remembering. Bandages are liable to slip, and starch adds to their security. Gauze bandages are preferable. On the completion of the bandage, cooked starch, such as is used in starching clothes, is rubbed into its meshes until a smooth, even surface is obtained. This dries in a few hours and holds the turns together, adds greatly to the appearance of the bandage, and increases its stiffness and security. It may often substitute the inconvenient and messy plaster-of-Paris bandage, and obviate

the necessity of using adhesive plaster, pins, etc., to prevent the turns from slipping.

Let me urge a trial of this starch bandage; it will be a revelation to those unaccustomed to its use. A neatly applied fracture dressing composed of bleached gauze bandages, into the meshes of which, when the bandage is completed, starch has been rubbed, is a work of art and a thing of beauty. A word on the question of bandages may not be out of place. The old bandage of unbleached muslin has been displaced in favor of the bleached gauze bandage. To neatly and correctly apply a muslin bandage requires both knowledge and skill. I almost regret to say that a minimum quantity of both often contents the surgeon in applying the gauze bandage. The rules of procedure are hardly the same in the two instances. Reverses are not so necessary in the gauze as in the muslin bandage, but it fails to give the firm support of the muslin one. With the muslin bandage, the spiral reverse was the typical form; with the gauze, the figure 8 is the standard. This is made by using figure 8 turns, one partly overlapping the other until the part is covered. Some surgeons use very narrow gauze bandages even for large parts, as the legs; this practice I hardly think is necessary. A two-and-a-half-inch gauze bandage can be used for both extremities, which can be neatly and satisfactorily covered without using a single reverse.

The question of operation in cases of fractures is a debatable one. Now that it is possible to operate almost always without wound infection, operations are justifiable when previously they were not to be thought of. The question of personal equation in the surgeon here becomes prominent. For an operation to be successful, the problems presented by the individual case must not only be skilfully handled, but the procedures must be carried out in such a manner as to insure prompt healing without suppuration.

This means that the technique employed by the surgeon must be efficient. To develop such a technique as will stand the test of the widely differing individual cases without failure necessitates both labor and experience on the part of the sur-

geon. Practice makes perfect. It is undoubtedly easier to carry out a rigid asepticism in a hospital operating room than it is in the home of the patient, where proper facilities are frequently lacking. For these reasons operations may be performed advisably by the experienced surgeon operating in a hospital that would be inadvisable in a private house by one who operates only occasionally.

The recommending of an operation entails certain definite responsibilities, and we should be prepared to meet them.

Before leaving the question of operation, I might state my belief that we do not operate on simple fractures with unbroken skin with sufficient frequency. Among such are fractures of the neck of the femur in people under fifty-five years; fractures of the upper third of the femur and some of other portions; fractures of the patella and olecranon with wide separation. In some fractures of the leg division of the tendo-Achillis is very useful. In bad fractures of the clavicle wiring is not a dangerous procedure. In elbow fractures, in which ankylosis is unavoidable, a resection will give a movable joint and much better result.

The question of operating is linked with that of failure of proper union. This is due in the larger number of cases to wide displacement of the fragments with the interposition of muscular or fibrous tissues. Hence an inability to sufficiently reduce the fragments is an indication to operate. It is not an uncommon fault for fractures to be treated conservatively which should have been operated on primarily. Many of the deformities seen to follow fractures are not only unsightly, but often seriously impair or even destroy the usefulness of the member and predispose it, as I have seen in several cases, to refracture. Modern surgery demands better results than were satisfactory in the past. It used to be the custom to practically treat all fractures conservatively and accept the results with proper resignation. This is no longer permissible. If we cannot place the fragments in such a position as to insure a satisfactory result, it is our duty, if the circumstances permit, to do so by operative means. Not only does non-union result from mis-

placed fragments, but likewise excessive callus. The paralysees and interference with the function of nerves, which not infrequently follow fractures, are often attributed to the nerve being included in and being compressed by the callus. While not prepared to deny that this may sometimes be the case, it is my belief that these nerve lesions are almost always due either to a direct injury of the nerve, usually by the fragments, at the time of fracture, or else to consecutive changes induced in the nerve by its being stretched over the sharp edge of a displaced fragment. This I have verified on several occasions. It is evident that if a nerve is stretched over the sharp edge of a fractured surface, when the callus forms it will of necessity include the nerve. For this reason it by no means follows that, because a nerve is found enclosed in callus, the callus is the cause of the symptoms rather than the injury sustained by being stretched over the sharp edge of bone. These nerve injuries are sometimes attributed to callus because their presence is so often only discovered after the removal of all apparatus and the use of the limb is attempted. It is extremely disconcerting to find, at what one has expected to be the conclusion of treatment, the unexpected appearance of this complication. It is most liable to escape recognition if fixed dressings have been employed early in the treatment of the case. This is one of the reasons that disinclines me to use plaster-of-Paris early in fractures.

In some fractures the immediate results are so disturbing as to prevent one for some days, and even longer, from ascertaining the full extent of the injuries. It is in these cases that it is particularly desirable to so dress our cases as to enable them to be examined at sufficiently frequent intervals. In some cases even a daily inspection for the first week and twice a week thereafter is not too frequent. Too often the pains of a neuritis are attributed to the broken bones and torn muscles and ligaments, and paralysees are allowed to exist unrecognized until firm union has occurred and use of the member is attempted. The formation of callus presents some interesting features. It is, I believe, due almost solely to the displacement of bone. In other words, the formation of callus is evidence that accurate approximation

has not been achieved. I had a case a few years ago which demonstrated this quite clearly.

A man had sustained a fracture of the upper third of the thigh with the customary anterior and outward displacement of the upper fragment to an unusual degree. Operation revealed a spiral fracture about two and a half inches long running upward, backward, and inward.

Traction being made by an assistant, the two fragments were fitted accurately one to the other and fixed firmly in place by two thick silver wires encircling the bone an inch and a half apart.

At the end of the seventh week an incision was made and the wires were removed. Union was found to be firm and the site of fracture was seen winding round the bone as a thin dark line. There was absolutely no thickening nor the slightest indication of any provisional or ensheathing callus. It is evident that in this case the callus which united the broken ends was between the bone surfaces and in the medullary cavity, because there was none external.

The exact approximation of the fragments in fractures of the base of the skull is the reason why callus is also lacking there.

The presence or absence of callus has a marked influence on the functional results obtained, especially in fractures in the vicinity of joints. If, as has been stated, callus is due to lack of proper approximation of the fragments, it is evident that if a joint is involved and the fragments are not approximated, we must expect limitation of motion. Limitation of motion due to this cause is almost insurmountable. The use of passive motion is usually of no avail, and healing progresses either with a resultant ankylosis or restricted motion. Repeatedly have I seen persistent passive motion practised much to the distress of the patient, with but little or no benefit resulting. It is in these cases that the X-ray is of service. Fractures which involve the joints not infrequently detach pieces of bone, which become more or less twisted out of their normal position, and later be-

come fixed, thus interfering with the motion of the joint. It is not a hopeful practice to endeavor to retain motion by passive movements calculated to push the fragments away; they cannot be displaced far enough to prevent their influencing the joint movements. The condition of affairs having been recognized by the X-ray, it is better to follow the advice of Roberts and others and pin the fragment in place, or deliberately cut down and replace it as it should be, retaining it with wire or other suture material, or even reset the joint.

The recognition of the uselessness of passive motion in overcoming limitation of movements in joints has caused some surgeons to advocate the treatment of fractures of the elbow without it until the splints have been removed and union has occurred.

If the fragments are in good approximation and the joint is kept quiet, the inflammatory effusion and callus is kept at its minimum, and the joint soon limbers up when restraint is once removed. Restoration of function can be hastened by baking the limb. The use of hot air, while serviceable in cases of fracture of healthy limbs, is deleterious in tubercular affections; hence in old cases the possibility of tubercular disease should be carefully excluded.

The question of passive motion is allied to that of massage.

I regret to say that, in spite of the attention of the profession having been directed to the use of massage in fractures many years ago, it still is not employed as much as it should be. This may be due partly to a distrust aroused by the extensive claims of some of its most ardent advocates, as Lucas Championnière and others.

Personally, while occupying a middle ground, the stand I take is none the less a positive one. I cannot follow those who treat fractures from the first by massage only without support. To my mind, the first principle in the treatment of fractures is that the two broken ends of the bone should be placed and held in as close approximation as possible. That this can be accomplished better with than without splints is at least my opinion. Even the ordinary movements of the body tend to disturb the

fragments, and unusual movements, such as one is constantly experiencing, disturb them still more. The fact that fractures, such as those of the patella, radius, etc., frequently unite with little or no support or protection, is no proof that they should not have been afforded both. There are few cases, indeed, where a fracture would not be benefited by a proper support skilfully applied. It need not always be elaborate; a fractured leg is sometimes best treated and most comfortable if allowed to rest for a day or two folded in a pillow. The use of splints is not incompatible with massage. As regards the time of its use, in many cases it can be commenced at once as soon as the fracture is seen. A light stroking "effleurage" of a recently injured limb need not cause pain, but rather be grateful to the patient, and tends to restore the circulation and promote the absorption of effusion. Its efficacy depends on the manner of its administration; anything approaching roughness is obviously unsuitable in cases of recent injury; and if real pain is experienced it is evidence that the massage is either unskilfully administered or that it is unsuitable to that case, and most likely the former.

It is true that there are some cases in which the local injury is so great in simple fractures that the treatment should be of the simplest character, such as the use of evaporating lotions; cases in which there is much bruising of the skin may be of this character. After the first reaction has passed, say in a couple of days, there is no longer any excuse for delaying massage. I regret to say that it is still too much the custom to use fixed dressings, which are allowed to remain on the part without removal for several weeks. This may promote the healing of the bones, but it does not tend to restore the soft parts to their normal functions. The worst effects of this treatment are seen in fractures of the leg. When the upper extremity is fractured, the patient rarely requires to be admitted to the hospital; but a fracture of the lower extremity interferes with locomotion, and consequently it is admitted for treatment in the wards. In order to make room for new patients, the temptation is great to put fractures of the leg up in plaster-of-Paris dressings and

allow the patient to leave the hospital on crutches. When, after the lapse of several weeks, the plaster dressing is removed at the out-patient department, it is usually found that, while the bones themselves have united firmly in a fairly satisfactory position, the leg and foot are swollen, œdematous, and stiff. The slightest attempt at movement causes pain. If now the case is left off and the patient allowed to go around, it is often weeks or even months before the muscles, tendons, ligaments, and soft tissues generally have become loosened sufficiently and restored to their normal condition to allow of painless locomotion. This is needless. Suppose the patient had remained in the hospital and been treated with the old-fashioned fracture-box; and that each morning the sides of the box had been lowered and the soft parts gently massaged and, as healing progressed, the joints gently moved, we would then by the time that union had taken place have restored the normal condition of the soft parts and the leg would be ready and in fit condition to resume its functions. It is *prima facie* evidence of inefficient treatment when one is compelled to institute an elaborate further course of treatment to overcome effusion and stiffness after complete union of the bone has taken place. The frequency of the massage depends on the individual case. In some twice a week will suffice, but in others daily massage is necessary. It is true that to give fractures this amount of attention will consume much time. This is so; but it is the only proper way to treat fractures, and when not carried out results in delayed convalescence and deprivation of the use of the injured member.

Limitation of movement may be the result either of displaced fragments, as already alluded to, or to inflammation and effusion in the soft parts. It is to this latter condition that massage is particularly applicable.

The primary treatment given to fractures varies with different surgeons. Many have wet applications applied; lead water and laudanum is a great favorite. Their importance seems to me to be overrated. Some have a habit of applying lead water to every case, and covering it with oiled silk or other impervious material.

This can hardly be necessary. Routine treatment is, and of necessity must be in many cases, bad treatment. Individual cases vary.

One frequently encounters cases in which there is little or no displacement, and which undisturbed give the patient no pain. What object is to be gained by wet applications in such cases is hard to see. They can be rendered perfectly comfortable by applying a nicely adapted and padded splint with gentle compression by a neatly applied bandage. Using a thin layer of cotton over the part under the bandage will be more acceptable than a moist dressing.

The use of wet dressings I am inclined to believe favors the formation of blebs by macerating the skin, and on that account are objectionable. In some cases, where redness and pain are prominent, some soothing application is of advantage; and here occasionally some form of wet dressing is desirable, and seems to add to the comfort of the patient and to aid in allaying the inflammation.

A favorite application is lint or gauze moistened with equal parts of glycerin and water. If the leg is the part involved, as is usually the case, the dressing is simply laid on its surface, and perhaps a light ice-cap added. In many cases a plain towel laid on the limb with the ice-cap is all that is necessary. No impervious covering is to be used.

The question of the extent to which it is desirable to use ambulatory dressings occupied the attention of the profession some years ago to a greater extent than it does at present. That it is possible to treat fractures even of the thigh with a certain degree of success without confining the patient to bed has been amply demonstrated, but the method, even as applied to fractures of the leg, has not been found desirable. It is possible to do many things which it is inexpedient to do, and this is one of them. In stating this, I do not mean to say that ambulatory dressings are never to be used. On the contrary, the surgeon should be familiar with the method, so that when proper cases present themselves it may be utilized.

The method is only intended for use in fractures of the

lower extremity, and one of the objections to it is the swelling and pain which arise when a recently fractured limb is placed for any length of time in the upright position. In fractures of the leg, when there is but little tendency to displacement, patients can, not infrequently, be induced to go around early in a fixed dressing and crutches.

I have made quite extensive use of silicate of soda or plaster dressings in which is incorporated a piece of strap iron which passes down one side of the leg and up on the other, being allowed to project about three inches beyond the sole. With a high shoe on the opposite foot and crutches the patient can go around with a considerable degree of safety. To make an efficient ambulatory apparatus that can be removed for purposes of massage entails considerable trouble, and the temptation is to allow the dressing to remain intact until consolidation of the bones is completed. For these and other reasons the method is only to be used in those cases in which it is impossible to retain the patient in the wards of the hospital, or where for special considerations one is willing to devote an unusual amount of time and trouble in order to obtain certain desirable objects.

When the thigh is the bone involved, if the fracture involves the shaft or upper extremity, the method is practically undesirable.

In fractures low down near the condyles, particularly in children, some form of orthopædic appliance, such as the hip splint of Thomas or Taylor, can be successfully used; but children are usually not pressed for time, and adults commonly prefer the comforts of a bed to the discomforts of a splint and crutches. Nevertheless, it is our duty to know what can be done to enable patients to get around early; and, if the necessity for an employment of the method arises, we should be able to give our patients the benefit of the treatment.